Introduction to Biodiesel & Oilseeds in Montana

Oilseed & Biodiesel Workshop

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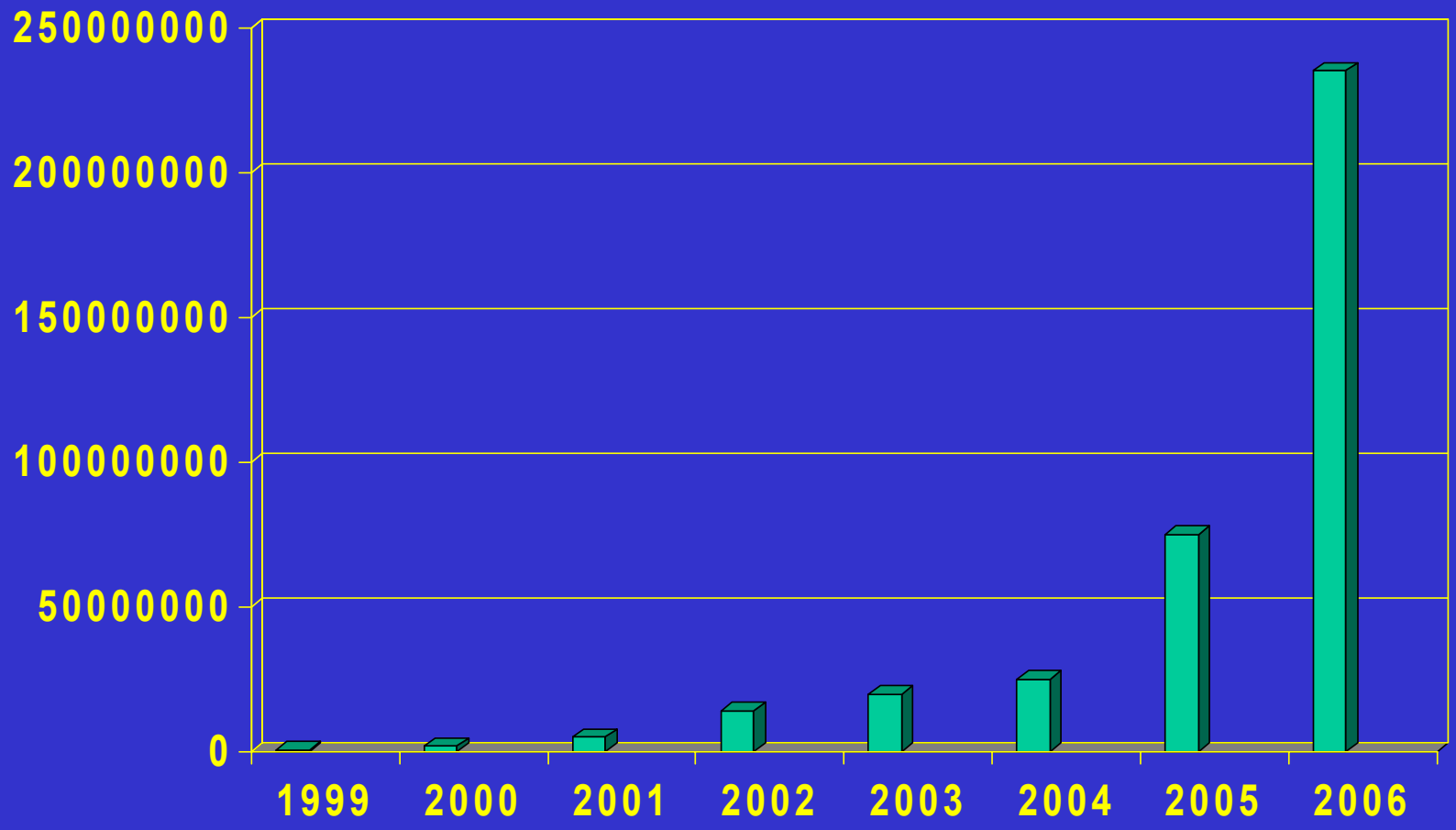
Opening Slide

Biodiesel can be produced from Montana oilseeds, providing a new crop for rotation that also benefits the environment. In any given year, there may be 5-million acres to plant oilseeds in a 3-year rotation with wheat or barley. Such a rotation is proven to increase grain yields. Biodiesel would be the bottom of the value chain, as oil from Montana oilseeds can also be used for culinary, cosmetic, and lube oil markets. Fuel is the low-cost market.

Presentation Overview

- What is biodiesel
- Oilseed Value Chain
- Benefits, Challenges
- Implications for Rural Montana
- Workshop Coverage

National Biodiesel Growth



Estimated Capacity, January 2007 is 864 million gallons/yr

Status of Biodiesel

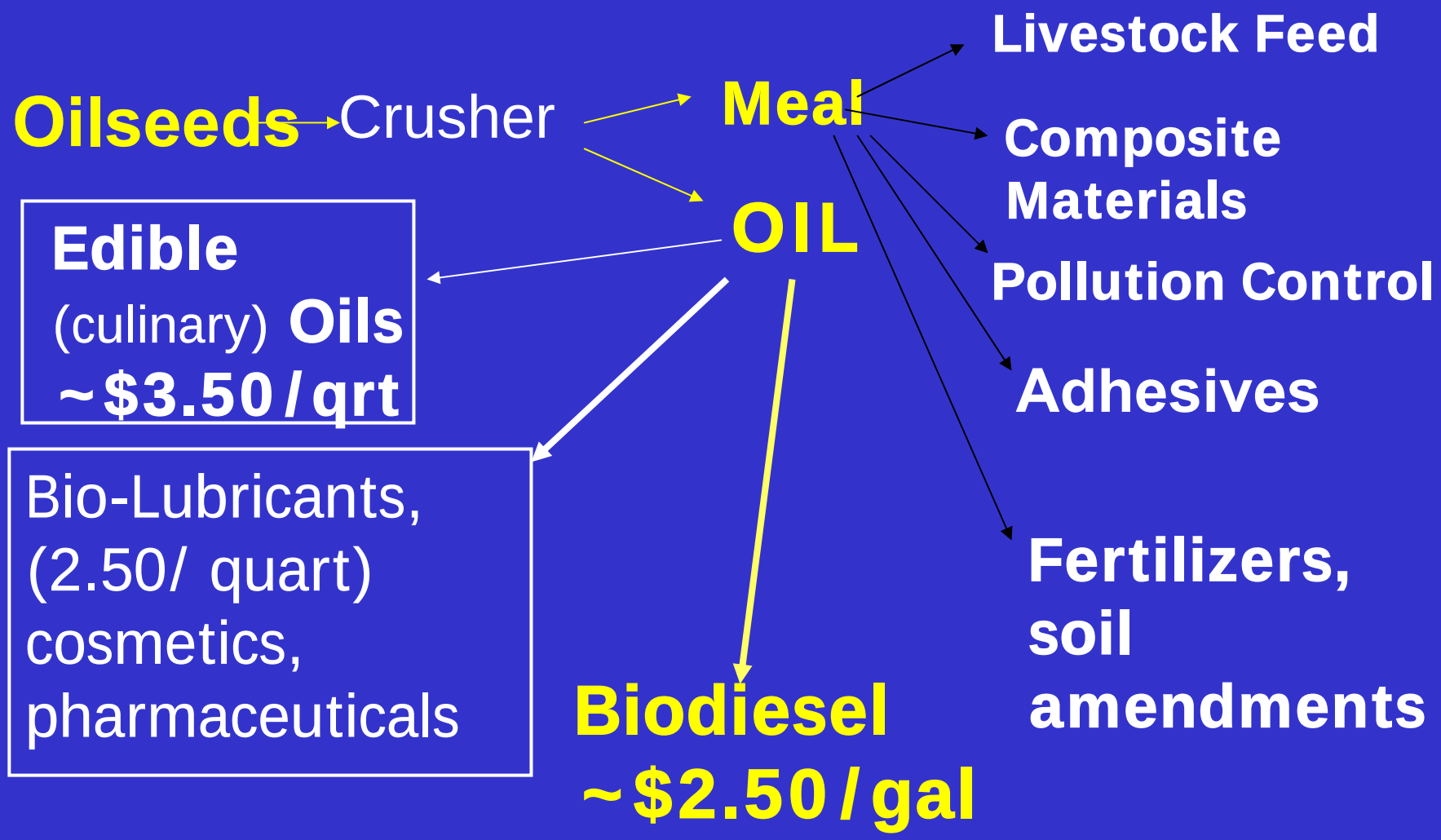
- Biodiesel is priced below petroleum-based diesel fuel in many places.
- Biodiesel sales in 2004 25 million gallons (mgy), in 2005 about 75 mgy, and in 2006 was about 225~250 mgy.
- NBB reports more than 107 operating biodiesel plants with 45 more in construction (December 2006).
- Hundreds are being planned.
- Goal is 1.85 billion gallons of biodiesel by 2015 to make B5 nationally (same amount as currently imported from Iraq to US)

Biodiesel Use in Montana

Seven retail pumps of biodiesel blends

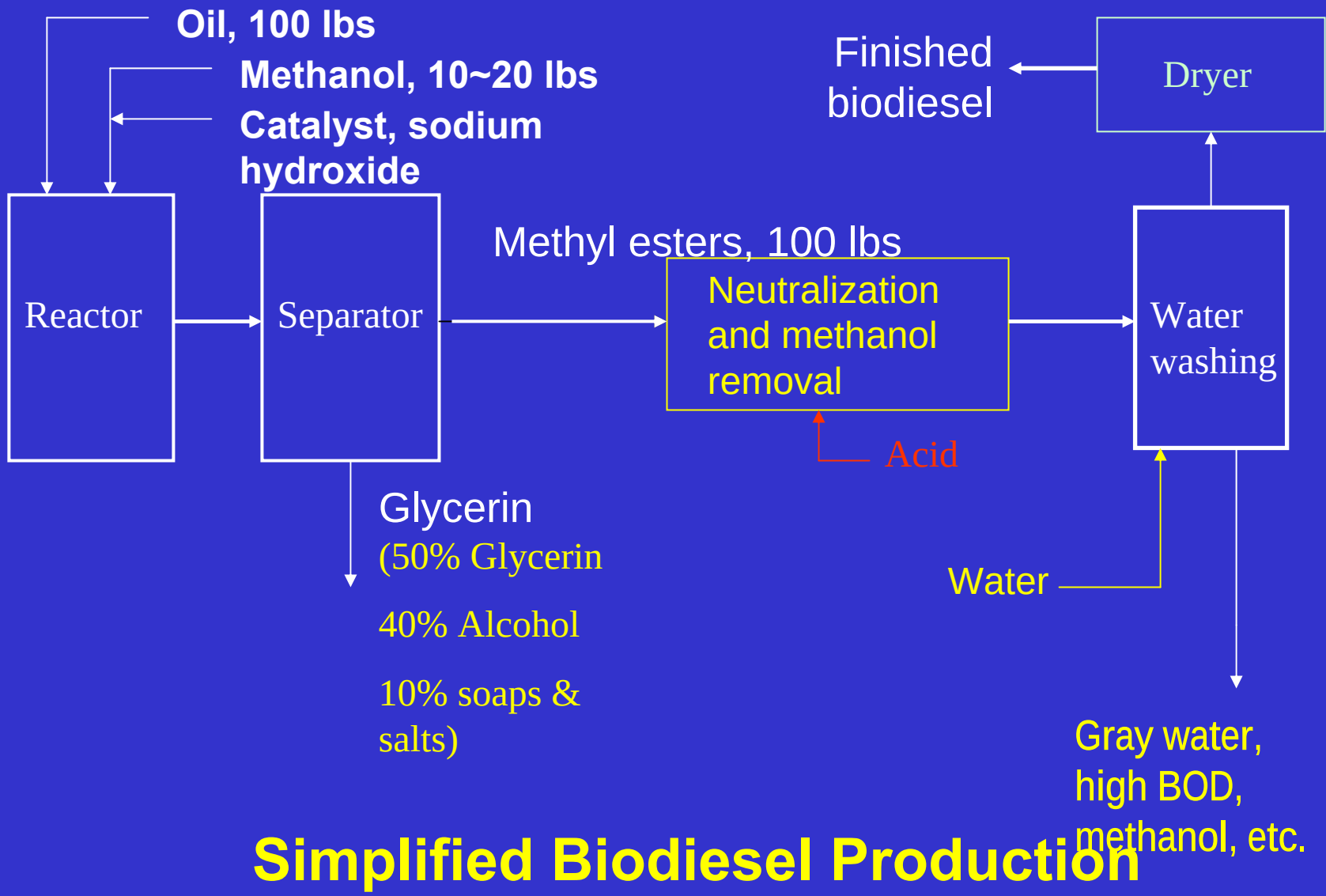
- 70,000 gallons of B100 (345,000 gallons of blend) used in 2004, and a bit more in 2006.
- Fleets: Yellowstone and Glacier National Parks, BLM, City of Bozeman.

Biodiesel is the low value product



Biodiesel in Montana

Biodiesel is not new, demonstrated by R. Diesel in 1900. Biodiesel is an animal or plant oil reacted with a catalyst and alcohol to make an ester used as fuel meeting ASTM D6751 fuel specification.



Simplified Biodiesel Production

Biodiesel in Montana

Biodiesel is not:

- **Unprocessed vegetable oil,**
- **Ethanol blended with diesel (E-diesel), or**
- **Fuel derived from gasification or liquefaction of biomass.**

Biodiesel in Montana

Biodiesel is needs to meet ASTM spec:

•ASTM Spec is needed to avoid this result. Left, piston from tractor and right, fuel filter fueled with 10% used fry oil after 60-days.

BIODIESEL BENEFITS

- **Safer (higher flash point)**
- **New market for producers**
- **Adds lubricity and cetane**
- **Lower emissions**

BIODIESEL BENEFITS

LOW INITITAL COST-no modifications (pre-1993)

SIMILAR POWER, VEHICLE RANGE, Blends in any proportion

HIGH BIODEGRADABILITY, EASIER SPILL CLEAN-UP FOR B-100

REDUCED Carbon monoxide, ODOR, SOOT

Challenges to Biodiesel

- Cost and availability
- Federal & local regulations (testing, quality)
- Sustainable, reliable oilseed supply--Montanan needs growers
- Local markets for co-products (where's the beef)
- Possible lower cost feedstocks (mustard, camelina)
- Good (short) transportation

Challenges for Biodiesel

Price & Availability

- Cost is feedstock sensitive (75-80%).
- Production cost is generally estimated to be about $0.55/gallon (small plant) to $0.30/gallon (large plant).
- Production cost = 7.6 x [oil price, $/lb] +$0.50 per gallon. example, canola oil @ $0.28/lb gives $2.63/gal before tax

Challenges for Biodiesel

Current federal excise tax credit is $1.00/gallon for biodiesel from virgin oil for fuel distributor

- **With current incentives, biodiesel should be $1.30-$1.50/gallon (without road tax). Actual price is set by the market.**
- **Biodiesel is less than diesel in some areas.**

How Might Biodiesel Grow

Self-Sufficiency, self-production & use:

Control of farm operating costs

Uses ~8,000 gal diesel/year, summer

No additional miles for fuel or to haul crop

Use meal on-site or for local feeding

<$5,000

$54,000>

Things to Know & Be Able to Show

1. Motivation-Why make biodiesel
2. Feedstocks & oil source.
3. Know and prepare to deal with safety issues and your local rules, and your fire official and insurance requirements
4. By-products and wastes.
5. Markets (storage & transport).
6. Know your limits and options: business plan.
7. Know what happens to off-ASTM biodiesel specification fuel and feedstock

Motivation

1. Why do you want to make biodiesel?

- Environment
- Self-sufficiency
- Fuel Security
- Local or regional economic development
- Hobby
- All are good reasons to make biodiesel

Motivation

Any reference to cost: Savings are relative to the cost of petroleum diesel

Equipment vs Labor costs

- **What is the value of your time** (unit on left takes more time than on the right, not as consistent or guaranteed ASTM fuel)
- **Utility and collection costs**

<$5,000

$54,000>

Feedstock

Know your source for feedstock oil, where are you getting the oil?

- Purchase oil.
- Seed or self-grown
- Used Fry Oil (not trap grease)

Feedstock

Know your source for feedstock oil:
Purchase vegetable oil

- **Bulk purchase, stable, available year-round supply on contract**
- **Spot market--at times too expensive**
- **Grow Your Own Oilseed**
- **Used Fry Oil**

Feedstock

Feedstock: Grow your own oilseed

- Crusher, contracted: $35 to over $100/ton
- Refined, Filtered, De-gummed oil
- Mechanical crush: 70-85% peak efficiency
- Storage concerns for meal over 3% oil
- Purchase small crusher

Feedstock

Feedstock: Used Fryer Oil

- Supply sustainability, costs of time and transport
- Needs more catalyst, wash water
- Probably requires federal reporting: Contact DEQ (Colin McCoy) about license
- Consistency and quality concerns-- some of whatever was cooked is still with the oil

Market

Know your market for fuel and coproducts

Making biodiesel for your own use may be your market.

Market: Selling to the Public

- **"Market" includes giving it to your neighbor**
- **Requires payment of excise taxes reporting**
- **Feds require ASTM testing to sell fuel and receive tax incentives—how will this be done?**
- **Federal (EPA and IRS) registration**
- **Liability issues with fuel**

By-Products & Wastes

Know what to do with the by-products and wastes.

- Meal (feed)
- Sludge
- Glycerol
- Methanol
- Wash water

By-Products & Wastes

By-products and wastes: Meal

- Near-by year-round feed facility (6.7 ton/1000 gal, 730 dairy cows/yr)
- Proper storage
- Possible use as soil amendment, fertilizer, biological herbicide/pesticide

Sludge (from used oil or crush)

- Proper Disposal
- Soaps

By-Products & Wastes

By-products and wastes: Glycerol (750 lbs/1,000 gal)

- By-product sales (cleaned, or heterogeneous catalyst) cosmetics
- Home-made soap
- Landfill (not land-apply)
- Boiler fuel with heating oil in proper combustor
- Wastewater treatment plant--not for septic systems
- Others (contact DEQ)

By-Products & Wastes

By-products and wastes: Methanol

- Recovered, recycled
- Safety, fire, and permitting concerns

Quality Fuel

Know how you will prove a quality fuel, limit liability, and meet the ASTM biodiesel specification. (testing, ASTM 6751, etc.)

Quality Fuel

- Self-use, co-op sign-off: users need know to risks
- EPA certification required for federal incentives and on-road use (Clean Air Act)
- ASTM 6751 required by EPA and IRS, adopted by Montana in 2005 and other states
- NBB membership helps
- Montana Motor Fuel Tax required, contact Kathy Murphy at MDT, 406 444-7276

Safety & Local Regulations

Know the safety issues related to production. Know local rules, and requirements of your fire official and insurance company.

Contact list provided on DEQ web site for most common facilities.

Safety Issues

- Methanol requires ventilation– VOC cartridges not effective; inside-outside limits
- Processor design should be spark-less, venting only to outside

Safety Issues

- Lye requires proper handling guidelines
- Design for lots of air flow
- Spill containment, earthquake-proof

Limits & Options

Know your limit and options:

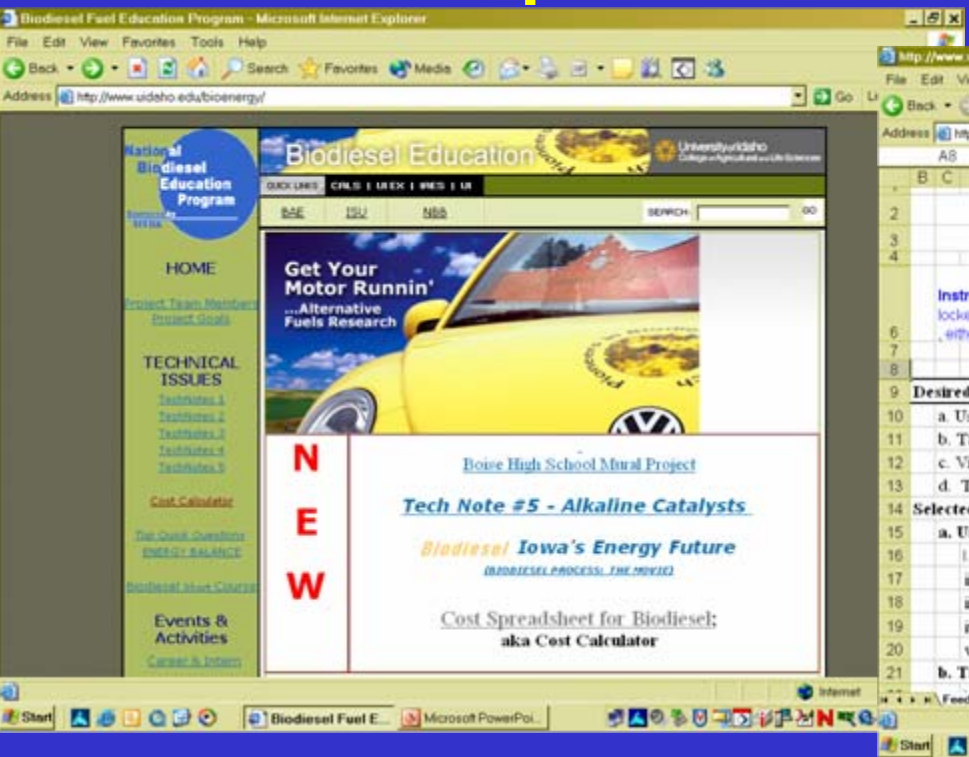
business plan or feasibility analysis

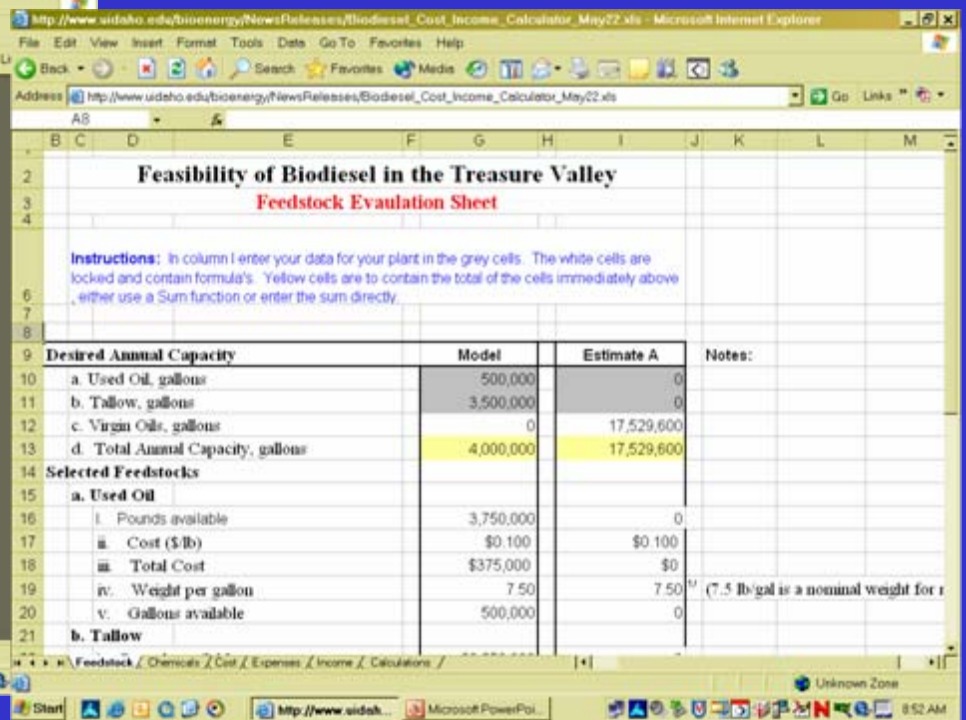
Limits & Options: Business Plan or Feasibility Analysis

1. Identify costs & sensitivity to cost concerns.
2. Helps organize the project on paper for local officials, insurance companies, regulators, and investors.
3. Identifies key actions in case of various unknowns.

Limits & Options: Feasibility Study

- Feasibility Study: cost spreadsheet for biodiesel.
- Example at www.biodieseleducation.org





How Might Biodiesel Grow in Montana

1. Built as modules in 0.1 to 8 mgy capacity, $1+ per annual gallon capacity
- Chester, 100,000 gal/yr, 10 yrs
- Montana Feed & Fuel LLC, 5 to 8 MM gal/yr, expand as practical

Implications in Rural Montana

1. Basis B2 (2% biodiesel): 9,300,000 gallons/yr.
2. Feedstock: canola ~108,500 tons, 168,000 acres, 40% oil content, 70% recoverable.
3. Invest $8.5~11,000,000 for a biodiesel plant.
4. Crushing ($3.5~10.8 million)

Center for Applied Economic Research
Montana State University-Billings

2005 Energy Symposium
October 18th, 2005

www.msubillings.edu/CAER/

The Economic Impact of MT Energy Projects

Implications in Rural Montana, Local/Regional

- 10 ~20 jobs
- 65,000 tons of meal ~$13,000,000 value ~65,700 dairy cows
- 6,250,000 lbs of glycerin ~ $312,000 as fuel**
- $2 ~4.6 million in operating costs, supplies
- $15.8 million in "Multiplier Value"
- $1.8 in other (transportation) costs
- $19.5 million for oilseed (value, $180/ton)

FOR MORE INFORMATION

- Oilseeds for Fuel, Feed & Future

Al Kurki, ALK@NCAT.org, 406 449 0104

- Biodiesel Tech Course. Jon Van Gerpen, 208 885-7891, jonvg@uidaho.edu
- Safflower, Sunflower, Flax: Jerry Bergman, jbergman@sidney.ars.usda.gov 406 433 2208
- Canola, Camelina: Alice Pilgeram, pilgeram@montana.edu, 406 994 1986
- Taxes: Kathy Murphy, MDT, kmurphy@mt.gov, 406 444 9256
- Used Fry Oil: Colin McCoy DEQ, CMcCoy2@mt.gov 406 444 9879

Upcoming Events

1. **Upcoming workshops:**
   - Biodiesel Technology Course, March 12-16, 2007 in Moscow, Idaho
   - **Up to YOU--**fill out the final survey, or let DEQ and other sponsors know (841 5252)**.**
2. **Publications:**

Building a Successful

Biodiesel Business

This Workshop

- MSU Oilseeds for this area
- Crushing Considerations
- Commercial Production
- Self Use & Production
- Basic Economics
- Feasibility & assistance
- Evaluation survey-what is needed next
- Add-on: discussion & oilseed contracting

FOR MORE INFORMATION

www.deq.mt.gov, select "bioenergy/biodiesel"

www.biodieseleducation.org

www.biodiesel.org

Howard Haines, 406 841-5252, hhaines@mt.gov

The End. Thanks for Listening, Questions?